

Development of Academic Thought on Cashless Transactions

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Abstract: *The objective of this study is to follow the development of academic thought by examining various studies that have been undertaken in the area of cashless transactions. With the recent implementation of demonetization in India by the Modi government, this field of study has acquired a renewed urgency. Models built and used by researchers focus on evaluating the costs and benefits that accrue to consumers if they switch to cashless modes of payments from traditional means of transacting with cash, and cash like instruments such as cheques, money orders, etc. Additionally, the contrast between cashless economy progress in developed and developing countries has also been highlighted.*

1. Introduction

Certain cashless transactions have become common in our daily lives, e.g. ATM cards and certain others, like E-Money are rapidly pervading our daily lives. What is popularly called ‘e-money’ is money in electronic form, that takes the form of a card which has money balance stored on it through electronic means. Once this money is recorded on a card it ceases to have association with any account but exists just as a claim on some financial institution. Apart from cards, ‘e-money’ can popularly be found as Network Money which involves only a software that allows fund transfer between computers through the internet. Electronic transfer of funds in banks, digital forms of currency, phone wallets are all different

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types in which cashless transactions can be carried out today. Even though this form of money transcends the boundaries drawn by convention and history, it provides for a hassle-free mode of transactions. Shoe-leather costs and inflation risk, the latter being somewhat surreal on a day-to-day basis, are minimized by the removal of the need to carry hard cash around for the common man. No doubt, our modern society is gradually catching the cashless syndrome. E-payments and others are now the order of the day at our workplaces and homes.

In the wake of recent developments across the world, studies on cashless economies have come to the forefront. The problem of the building quantum of black money held in the hands of citizens of much of the developing world is real and present. Evading taxes and source recognition, a staggering amount of money is channelled in the black market and a significant portion of it is hoarded in cash by business dealers and so on.

In India for example, the major chunk of black money was thought to be safely deposited in international bank accounts and invested safely in real estate or gold. The government's recent move to withdraw high denomination currency notes from circulation brought a significant chunk back into circulation. As per India Ratings and Research, a Fitch group company and credit rating agency, the government's demonetization step will destroy 12% of the black economy in India, which is directly attributable to hard cash.

2. History of Digital Payment media

The first publicised move towards cashless transactions was made by cryptologist and inventor, David Lee Chaum. He introduced the globe to the idea of digital cash in a research paper in the year 1983, which he went on to implement by establishing DigiCash Inc. in 1990, a corporation in Amsterdam that dealt with electronic money and doing away with the need for bank intermediation. The company became insolvent and got sold to

eCash almost a decade later in 1998. Then, simultaneous developments happened in 1997 in the field of mobile payments. Coca Cola introduced a limit set of vending machines which customers could buy from by setting up a transaction system with the machine via SMS instead of dealing in coins and change. In the same year, Merita Bank, based in Finland and now merged with the Swedish Nordbanken, started the trend of mobile banking. The next breakthrough came in the form of PayPal, founded in 1998, which gave the world a large online system to make payments as against cheques, drafts, money orders and other conventional methods. Another system, 'E-gold', founded in 1996 by Gold & Silver Reserve Inc., attained immense popularity as an online interface allowing users to open accounts holding grams of gold as opposed to digital money. However, due to rising fraudulent activities, the portal ran into trouble with the U.S. Government. It faced issues because it was used by criminals and was raided by US Feds in 2005.

In 2008, bit coin was introduced, which marked the start of digital currencies, and was made decentralized in 2009. It is a form of secure, crypto-currency which has revolutionized the world of alternative payment modes. On that note, a remarkable fact is that Sweden is the first country to introduce the system formally. In 2015, Bitcoin was launched on the Nasdaq Stockholm exchange. Between December, 2012 and May, 2014 an estimated 266000 Swedish Krona was being exchanged for bitcoins on a daily basis². Later in 2016, the largest banks of Norway, DNB and Nordea, claimed to avoid cash transactions in every way. The KTH Royal Institute of Technology, Stockholm, has conducted a study, according to which the Swedish are at ease with digital forms of payment as compared to traditional cash transactions. An app called Swish has been developed as a collaboration between the Swedish and Danish banks which facilitates digital transfer of funds through smartphones. Moreover, the Sveriges Riksbank has implemented negative interest rates and is holding strong grounds.

² Source: <http://bitcoincharts.com>, Safello and BTCX. Revision: The Riksbank

3. Evolution of Thought regarding Cashless Transactions

As far as the history of this thought is concerned, cohesive works exist which string together the beginnings of cashless transactions. In June 2012, Francesca Trivellato (The University of Chicago Press) published an article on the history of the cashless world (Credit, Honor, and the Early Modern French Legend of the Jewish Invention of Bills of Exchange) in the Journal of Modern History section. Trivellato traced the history of credit to the seventeenth and eighteenth century, when it was alleged that the Jews ousted from France came up with the concept of 'bills of exchange'. This socio-economic work with strong historical linkages gives an idea about the background of cashless transaction and facts such as how France has a major role in evaluating this system. The takeaway from the paper was about the task of rating credit-worthiness, distinguishing between legitimate financial agreements and bad ones, keeping in my social, cultural and legal criteria, and how this process dates back to the fourteenth century.

Consumers across the globe are faced with trade-offs they have to evaluate before making choices. The switch from conventional banking means to digital payments requires the conscious understanding of people and this is the starting point of implementing cashless systems. Kenneth J. White (2006) in 'Consumer Choice and Use of Bank Credit Cards: A Model and Cross-Section Results' (Oxford University Press) lays out a microeconomic framework of the functioning of the transaction systems across the world and ages. He associates the subject of study with choice theory and studies the rational choices made by people when it comes to picking a mode of payments – cheques, cash or cards. White adopts an analytical approach to this research problem and takes a cross-sectional sample through banks consisting of 649 households. By listing out dependent and independent variables, the author runs a series of regressions to estimate the cost effects on consumer's choices. The empirical results are numerous ranging from the effect of race to the effect of age on the usage of cards, for example the elderly are averse to using modern

transaction methods like credit cards while the ‘non-white’ resort to use cards in the face of their cheques not being credibly accepted by merchants. The study reiterates that acceptance of a new and modern mode of transaction like the emerging electronic funds system takes a considerable amount of time and depends on a multitude of factors. According to the statistical results obtained in this process, the transaction costs of credit cards should be reduced from both the banker’s and the merchant’s side in order to incentivise the user to switch to electronic mode of payment.

Yves Pierre (2009) added another facet to this discussion in his work by establishing the relation between this system and labour economy as a subset of the consumer population. Firms and businesses form another section of consumers, facing a different set of costs and benefits associated with cashless transactions. From the paper of Yolande Hiriart and David Martimort (2006) (*The RAND Journal of Economics*) we get the idea about how this system affects the firm-level business. He uses a model with a parameter like moral hazard problem, economic risk and liabilities, and uses some basic economic theory like dominant principle. Next, Don Hudson’s article (May 2005) published by American Bar Association describes the idea about how this system works in daily life and constructs a chain of daily life to the economic system by cash flow with Recurring Payments Debit Cards, establishing merchant account etc. Additionally, the paper by David Levinson and Andrew Odlyzko (2008) (*Royal Society*) gives us the idea how this system is related to the influence of transaction costs on Transportation and Communication

Continuing with the ordering of though pertinent to cashless economies, once the discussion about the microeconomic aspects of such systems is dealt with, the linkages with the macroeconomic world need to be focussed on. So, with individual consumers, producers and microeconomic realms covered, the effect of a cashless system on the macro-economy comes next. Hwagyun Kim and Chetan Subramanian (2006) (*Journal of Money, Credit, and Banking*) together built a relationship between digital cash system, transactions cost and interest rate

rules. They setup a New Keynesian model wherein they try to estimate the effect of real money balances on variables of macroeconomic importance like growth rate and inflation. Money or cash is considered to be the medium of exchange and transactions cost introduce the same in the model. For cases where the economy is to be cashless, the transaction cost is zero.

Bennett T. McCallum's article (2008) named 'How Important Is Money in the Conduct of Monetary Policy?' published by Wiley (The Ohio state University Press) in the *Journal of Money, Credit, and Banking* gives a concept about how this cashless monetary system effects the monetary policy for a country through a fundamental model to explain the relation. The results obtained from the model built and run by McCallum draw the conclusion that in an economy with circulating cash and money as medium of exchange, the nominal rate of interest and the average rate of inflation can be monitored and effectively controlled by the Central Bank. However, in contrast to this, when an economy becomes cashless or essentially non-monetary, the very same power of the central bank becomes feeble or is lost as the crucial rates of interest cease to fall within the control of the central bankers. The article of Benjamin, Andrew, Randall (2012) published by Oxford Press in *The Review of Economic Studies* section also gives us similar concept like the relation between cashless system and liquidity of money. Monetary policy deals with the monetary and liquid aspects of any economy, handled by central banks across the world, and in the process targets issues such as inflation and growth.

In this context there have been several papers like that of Peter Englund (1989) (even when it was not working then) which gives us an idea of digital cash in relation to monetary policy. The findings of the paper suggest that the rule of optimum quantity of money as proposed by Friedman applies in a cashless economy scenario, which also demands a marked decrease in the money base as innovations in the financial system keep blooming. Output on the other hand will grow depending on the elasticity of substitution. Another implication found in this study is regarding the reserve requirement of banks. The share of credit good

skyrockets in a cashless economy against cash goods. So, it can be said that the more cashless an economy becomes, the lesser should be the bank reserve requirement in it. The prime objective of this work is to analyse the welfare situation that arises from the composition of consumption in an economy which is moving towards being cashless. A limitation, as identified by the author, in the model built here is that the innovations in the monetary system do not enhance welfare in a huge way as people choose cash and cheques over cards for certain transactions which take lesser time to be completed with the former.

Having covered the theoretical facets of this subject of study, attention can be rightly shifted to the real-world practical aspects of cashless systems. The need to establish a link between safe-keepers of money, namely the banks, and interfaces that ease the process of making transactions, was felt widely. There have been several papers on data processing and building the connection with each and every bank, the paper of Ian F. G. Baxter (University of Toronto Press) and J. S. Cramer (American Statistical Association) gives us some concept about that. The paper by Malte Kruger and Franz Seitz (2014), published by Deutsche Bundesbank, is one of the most expansive works in existing literature that deals with the topic of ‘Costs and Benefits of Cash and Cashless Payment Instruments’. It estimates the overall cost and benefit of cash and cashless payments instrument. This is a brilliant paper in terms of the real effect of this system. The study presented here discusses an important economic topic. Virtually every transaction in the real economy results in a payment being effected. In making these payments, households and businesses make use of a wide variety of payment instruments, starting with cash and ranging to card payments, direct debits, and credit transfers, to name but a few. Each of these instruments fulfil specific user needs, but also generates costs. The size of these costs and the scale of the economic benefit have increasingly become a topic of academic discussions over the last years and, at times, also the focus of general public debate. How high are these costs? Who bears them? Are these costs allocated on a “user pays” basis?

Could a change in user behaviour reduce the economic costs, while increasing the benefits? These are all important and exciting questions which the Deutsche Bundesbank, the German Federal Bank, too, is addressing as part of its statutory mandate for payments in Germany.

The second part, “Costs” is designed to estimate the respective costs arising from the use of cash and cashless means of payment in Germany. Part three, “Benefits”, plans to describe the benefit categories associated with the same and to assess their relative importance. Great uncertainty is attached to estimates of the costs associated with the payment system. Due to the many unique aspects of the different countries, we would especially warn against attempts to apply the findings from one country to another without making adjustments. This study does not alter that either.

However, there are some areas which are more readily suited to estimates and other areas which can only be determined by a marked absence of precision. The latter include the internal costs incurred by households and businesses. It is easier to make estimates in situations where payment services are offered on the market. The commercial banks are important suppliers of payment services. Depending on whether the current extremely low rates of interest are taken as a basis or the rates are smoothed over an interest rate cycle, the payment services provided by banks are quantified at between €20 and €27 billion (0.78 – 1.05% of GDP). This value is to be regarded as more of a lower limit because payment transactions presumably provide further revenue in the form of preferential loan and deposit terms. The other suppliers play a much less significant role in our calculation. This is due in part to the fact that they operate as service providers for the banks, and the banks bill the customers for the costs that the former incur. An estimate of the direct revenue achieved with non-banks by service providers in cash and card payments produced volumes of under €1 billion. Factoring in findings from external estimates of the internal costs of businesses, we can put the macroeconomic significance of cash and cashless payment media at a figure of at least 2% of GDP all in all. However, it is important to tread with caution when

interpreting estimates of the internal expenses incurred by businesses and private individuals. Finally, one should observe that cost estimates also ignore a number of quality-related factors, such as the role of cash in monetary policy, questions of data protection or the importance of different payment media in crisis phases.

Pros and cons of such revolutionising innovations are also vast and case studies exist in various regions of the world to validate concern and hope. The Journal of the International African Institute published an article by Keith Breckenridge (2010), 'The World First Biometric Money', which explains certain things about the history of the e-Zwich. This was the name given to the settlement system between banks introduced by the Central Bank of Ghana in the year 2008. It was a functional biometric system which used fingerprints for identification of account holders. Such a move was considered ambitious and brave for a region that lacked basics of civic amenities and legal protection. However, one of the major implications of this was a step towards a cashless West African economy which would stem from a biometric money supply. The high possibilities of a grand success for the Ghanaian Central Bank formed the crux of this work by Breckenridge.

Ibiyemi, Aliu, Daramola (2012) published a report which again dealt with the biometric recognition patterns. They built on the conventional identification methods of speech and face recognition to feed the process into a machine rather than letting it depend on human subjectivity. Human tendencies of mixing up with races, specifically are risks that can be eliminated by vesting the responsibility in programmed machines. Remote identification in the physical absence of the customer can be completed with speech inputs. The former require a principal component analysis or PCA that yields eigen vectors of the covariance matrix built from the face image. This is what is uniquely named 'eigenface' and ultimately gets stored as a grey-scale image instead of RGB. Speech recognition involves word segmentation, filtering and frame detection. Works like this ratify the idea of accelerating innovations in financial transactions to involve more of

technology and less of human intervention. The case made for data mining by the authors is a positive development in the line of implementation of cashless instruments.

John H. Munro (2009) (published by Franz Steiner Verlag) describes the cashless world with the example of developing country. Before that, every paper in this context was based only on developed urbanized society. In recent years, the Nigerian economy is a special example of this. There have many papers explaining several aspects of this system like the one on Nigerian Economy by Olalekan S. Akinola (2012), which starts off by categorically defining cashless economies, instruments of cashless payments with specific examples of success and failure in credit and debit cards, smart cards, stored-value cards, ATM cards, smart phones and many others. With a clarifying introduction and detailed explanations, the author moves on to the key area of interest here which is the security threats associated with electronic mode of payments. The major problem pointed out is that related to computer hackers in a situation of non-physical identification and authorisation of the user. Similarly, customer concerns regarding the electronic log and trails they leave on the internet. Another factor highlighted is the lack of trust in global financial markets. The solution suggested by Akinola is application of data mining to the structural patterns seen in data available in the case of cashless transactions. Classification, clustering techniques, deviation detection and social network analysis are a few of the methods under the broad umbrella of data mining, research into which is urged by the author, especially in the field of temporal data mining. The highlight of this paper was the application of a data mining model to the real cashless world which would be characterized by high volume transactions. In such a scenario with large-scale anonymous transactions, data mining can become a revolutionising technique.

Gupta, Roy, and Trivedi (2004) explain it in the context of Indian economic structure and they explain it by Theory of Practices rules. Attempts to understand the role of TPAs, and examines the issues that need

to be taken into account while evaluating their usefulness and functioning. Many other banks and corporates like HID Global and HDFC published various papers which give us the concept of advantages and disadvantages of this system, among them being the paper published by HID Global named 'Cashless Payment Solution' is a good one.

In this context the paper of MasterCard Advisors of cashless society is very important in that the paper explains in details about the problem and solution of cash less system. According to them the main problem is that the world's population has access to multiple payment options but cash still accounts for 85% of all consumer transactions throughout the world. As a solution, MasterCard Advisors created a global study that showcases cash usage and the conditions that lead toward removal of cash.

4. Conclusion

The world has come a long way from the age of commodity barter to crypto-currencies. Cash has been the conventional medium of exchange since decades but like every trend it is gradually fading. There was a time when lack of currency notes would instigate a bout of panic in the common man. However, with the development of alternate, unconventional modes of completing transactions, the psychological dependence on cash has also come down. Convenience is a much appreciated added benefit of cashless transactions. The advent of technology backs the advent of cashless economies. Governments eye these technologies as a way of dealing with corruption and widespread black market.

With every transaction being accounted for on an interface directly or indirectly connected with banks, the possibility of hoarding cash has become odd. Literature on digital payments has dealt with its importance, the comparisons between its costs and benefits as well as the current status across geographies. There are strong differences between the applications of cashless interfaces in developed and developing words. The socio-

economic atmosphere and the technological advancement of countries determines the penetration of the digital thought.

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